DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on January 25, 2008 has been entered.

Status of the Claims

Applicant's amendments to claims 1, 3 – 10, 13 and 16 are acknowledged, as well as the cancellation of claim 2.

Currently, claims 1, 3 – 18 and 32 are pending and under examination.

Withdrawn Rejections

The previous rejection of claim 1 under 35 U.S.C. 112, second paragraph, is withdrawn in view of Applicant's amendments filed January 25, 2008.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 4, 7, 8, 10, 11, 13, 14, 16, and 17 are rejected under 35 U.S.C. 102(e) as being anticipated by McGrew et al. (US 2006/0154248).

McGrew et al. teach a sensor array device (reactive chip) comprising array (capture) probes fixed on each of three or more vibratory elements 400 (vibration areas) arranged on a substrate (support), the array probes being able to bind to a target analyte substance, wherein the substrate consists of a thin layer 412 (area) surrounded by a thick area 424 and the vibratory elements are positioned at the thin layer, wherein each vibratory element has a vibration-generating part having a first electrode 404 and a second electrode 420 between which a membrane 408 (piezoelectric/electroconstrictive element) is sandwiched, and wherein the vibration generating part is on the upper and/or lower surface of the thin layer (see Figures 1, 4 and 16; paragraphs [0015]-[0019], [0083]-[0089], and [0091]; and claims 13-18).

With respect to Applicant's claim 4, the substrate (support) has a thin layer 412 (area) surrounded by a thick area 424 and has the vibration-generating part 408 on the upper surface of the thin layer (see Figures 4a-4e; and paragraphs [0083]-[0089]).

With respect to Applicant's claim 7, a lead wire 420 for one of the first and second electrodes 420 is employed in common (see Figures 1, 4 and 16; and paragraphs [0083]-[0089]).

With respect to Applicant's claims 8, 11, 14 and 17, the sensor includes a means, i.e. detector, for measuring the resonance frequency of the vibratory elements (see paragraphs [0016] and [0125]; and claim 13).

With respect to Applicant's claim 10, the array (capture) probes can be different on each vibratory element (see paragraph [0019]).

With respect to Applicant's claims 13 and 16, the sensor array can employ an arrangement of at least four vibratory elements in a matrix of n x m wherein n is 2 and m is 2, with the same or different array probes fixed in each vibratory element (see Figures 1, 4, and 16; paragraphs [0015]-[0019], and [0091]; and claims 13-18).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over McGrew et al. (US 2006/0154248) in view of Ebersole et al. (US 5,658,732).

The McGrew et al. reference, which was discussed in the 102(e) rejection above, fails to teach the coating of the surface wherein the array (capture) probes are fixed.

Ebersole et al. teach a biosensor detector and method for detecting biological targets using specific binding and a piezoelectric element. The biological targets are detected through the binding of the targets to specific surface capture reagents that are immobilized on the detector surface. The immobilization of the surface capture reagents can be accomplished through direct absorption, or through the use of a surface coating. The coating of the surface with some sort of "adhesion promoter," polymer layer or monolayer film serves to enhance the binding of the surface capture reagent, as well as promote greater coverage of the capture reagent through the use of higher surface area coatings (see Abstract; and column 15, lines 30-67; and column 16, lines 1-6).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include with the sensor array of McGrew et al. the coating of the surface as taught by Ebersole et al. because Ebersole et al. teach the benefit of coating a detector surface when immobilizing surface capture reagents specific for a target analyte because the coating serves to enhance the binding of the surface capture reagent, as well as promote greater coverage of the capture reagent through the use of higher surface area coatings.

Claims 5 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over McGrew et al. (US 2006/0154248) in view of Takeuchi et al. (US 2003/0033700).

McGrew et al. further fail to teach the placement of the vibration-generating part on the lower surface of a thin area of the support or substrate, or that the thin area corresponds to a space within the thick area.

Takeuchi et al. teach an integrated piezoelectric/electrostrictive film type element comprising a substrate 1 and an operating section 5, wherein the operating section comprises an upper and lower electrode 2 and 4, and a piezoelectric/electrostrictive element 3 (see Figures 1-2). The substrate 1 is created to have a thin vibrating section 1a and a thick edge 1b, which together create a cavity 6, wherein the operating section 5 is placed either on the upper or lower surface of the thin vibrating section (see Figures 2b and 4). The placement of the operating section on the upper or lower surface of the thin section of the substrate allows for the improvement of the operating characteristics of the operating section by obtaining a high response and large displacement of the piezoelectric/electrostrictive element (see paragraphs [0048]-[0050], [0108], [0109], [0117] and [0118]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include with the device of McGrew et al. the placement of the vibration-generating part on the upper or lower surface of a thin area of the substrate, wherein the thin area represents a space or cavity within the thick area, as taught by Takeuchi et al. because Takeuchi et al. teach the benefit of placing an operating section, i.e. vibration-generating part, of a piezoelectric/ electrostrictive

element on the upper or lower surface of a thin section of the substrate in order to allow for improvement of the operating characteristics of the operating section by obtaining a high response and large displacement of the piezoelectric/electrostrictive element.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over McGrew et al. (US 2006/0154248) in view of Heller et al. (US 5,605,662).

McGrew et al. fail to teach that a lead wire for each of the first and second electrodes is independent from each other.

Heller et al. teach a microelectronic device that is designed and fabricated to carry out and control multi-step and multiplex molecular biological reactions in microscopic formats. The device includes a matrix of addressable microscopic locations on its surface, wherein each individual micro-location is able to electronically control and direct the transport and attachment of specific binding entities to itself. Each addressable location contains an underlying direct current (DC) micro-electrode supported by a substrate, wherein the micro-electrodes each contain their own independent lead wire (see Figure 3; Abstract; and column 5, lines 24-42; and column 6, lines 44-56).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include with the device of McGrew et al. the use of independent lead wires to the first and second electrodes as taught by Heller et al. because Heller et al. teach the benefit of creating a substrate with independent addressable microscopic locations, wherein each addressable location contains a DC

micro-electrode supported by a substrate, in order to allow for each individual micro-location to be able to electronically control and direct the transport and attachment of specific binding entities to itself.

Claims 9, 12, 15 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over McGrew et al. (US 2006/0154248) in view of Thompson et al. (US 2003/0214200).

McGrew et al. teach the use of an alternating-current power source connected to the first and second electrodes (see paragraphs [0016], [0018], and [0089]), but fail to teach the additional connection of the electrodes to a direct-current power source.

Thompson et al. teach of sensors comprising a piezoresponsive material. The piezoelectric sensing element is preferably embodied as a thin strip, wherein the deflection of the strip caused by an applied force creates a voltage signal that is produced through two or more electrical contacts that are connected to the piezoelectric material. Such piezoelectric sensing elements are useful over a range of frequencies, ranging from near-zero frequencies associated with direct current, up to ultrasound frequencies associated with alternating-current (see paragraphs [0003]-[0007]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include with the device of McGrew et al. the connection of the electrodes to both alternating and direct-current power sources as taught by Thompson et al. because Thompson et al. teach that piezoelectric sensing elements are useful over a range of frequencies and therefore, in order to create near-zero

frequencies a direct-current source is needed, and to create ultrasound frequencies, an alternating-current source is needed.

Response to Arguments

Applicant's arguments filed January 25, 2008 have been fully considered but they are not persuasive. Applicant argues (see pages 5-6) that the McGrew et al. reference (US 2006/0154248) used in the 35 U.S.C. 102(e) rejection fails to teach that the support **consists** of a thin area surrounded by a thick area. However, this argument is not found persuasive.

Under Section 2100 of the MPEP, the term "consisting of" is defined as a transitional phrase that excludes any element not specified in the claim (see MPEP § 2111.03). Here, Applicant has recited that the "support **consists** of a thin area surrounded by a thick area," which requires the support to only include a thin area and a thick area. The "support" or substrate taught in the McGrew reference also "consists" of only a thin layer 412 (area) and a thick area 424 (see Figures 1 and 4; and paragraphs [0015]-[0019], [0083]-[0089], and [0091]; and claims 13-18). Therefore, the reference does read on this limitation.

With regard to the recitation requiring the "thin area" to be "**surrounded** by a thick area," the term "surrounded" is defined as "to occupy the space all around something" (see Encarta World Dictionary). Further, the specification does not specifically define this term. Therefore, the device taught by McGrew et al., which consists of a thin layer 412 placed on top of a thick area 424, would read on the

definition of "surrounded" because the thick area 424 does in fact occupy the space around the thin layer 412.

Therefore, the 102(e) rejection over Applicant's amended claim 1 is maintained as being anticipated by McGrew et al. because the McGrew et al. reference does in fact teach the required limitation of a "support" that "consists of a thin area surrounded by a thick area."

Conclusion

No claims are allowed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jacqueline DiRamio whose telephone number is 571-272-8785. The examiner can normally be reached on M-F 9-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Long Le can be reached on 571-272-0823. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jacqueline DiRamio/
Examiner, Art Unit 1641

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